WHAT IS CLAIMED IS:

1. A method for the formation of a refractory metal nucleation layer on a semiconductor device substrate, the method comprising:

depositing a metallic barrier layer on the semiconductor device substrate;

exposing the metallic barrier layer to a silicon containing gas to form a layer of silicon on the metallic barrier layer;

exposing the layer of silicon to a refractory metal containing gas such that the refractory metal containing gas undergoes a reduction reaction with the layer of silicon resulting in the formation of a refractory metal layer on the metallic barrier layer; and

conducting an alternating exposure of the metallic refractory layer to the silicon containing gas and the refractory metal containing gas to deposit additional refractory metal on the refractory metal layer and thereby increase the thickness of the refractory metal layer and thereby form a refractory metal nucleation layer.

2. The method of claim 1 further comprising, during the depositing step, depositing a titanium-nitride (TiN) barrier layer.

3. The method of claim 1 further comprising, during the depositing step, depositing a tantalum-nitride (TaN) barrier layer.

4. The method of claim 1, wherein the silicon-containing gas is a silane gas and the refractory metal layer is a tungsten layer.

5. The method of claim 4, wherein the silicon containing gas is monosilane and the refractory metal containing gas is WF_6.

6. The method of claim 2, further comprising during the depositing step, depositing a TiN layer with a thickness in the range of 20 angstroms to 1000 angstroms.

7. The method of claim 1, wherein the first exposing step forms approximately a monolayer of silicon on the metallic barrier layer.

8. The method of claim 1, wherein the first exposing step is conducted at a pressure in the range of 40 Torr to 300 Torr.

9. The method of claim 1, wherein the second exposing step is conducted at a pressure in the range of 40 Torr to 300 Torr.

10. The method of claim 4, wherein the conducting step forms a tungsten nucleation layer with a thickness in the range of 20 angstroms to 1000 angstroms.

11. The method of claim 4, further comprising during the conducting step:

exposing the tungsten layer to the silane gas to form a silicon layer on the tungsten layer;

exposing the tungsten layer, which has been exposed to the silane gas to form a silicon layer thereon, to a tungsten containing gas such that the tungsten containing gas undergoes a reduction reaction with the silicon layer, thereby depositing tungsten on the tungsten layer and increasing the thickness of the tungsten layer; and

repeating the steps of exposing of the tungsten layer to the silane gas and exposing the tungsten layer to the tungsten containing gas until the tungsten layer has been increased in thickness sufficiently to function as a tungsten nucleation layer.

12. The method of claim 11, further comprising during the repeating step, repeating the steps a number of times in the range of one to ten.

13. The method of claim 11, further comprising after the conducting step, depositing a tungsten core layer on the tungsten nucleation layer.

14. The method of claim 13, wherein the depositing of the tungsten core layer employs a tungsten chemical vapor deposition reaction wherein tungsten hexafluoride is reduced with hydrogen (H_2).

15. The method of claim 13, wherein the step of depositing a tungsten core layer is conducted at a pressure in the range of 1 Torr to 300 Torr.

16. The method of claim 15, wherein the first exposing step, the second exposing step, the conducting step and the depositing step are all conducted at a pressure in the range of 40 Torr to 300 Torr.

17. The method of claim 15, wherein the first exposing step, the second exposing step, the conducting step and the depositing step are all conducted at a single pressure in the range of 40 Torr to 300 Torr.

18. A method for the formation of a tungsten nucleation layer on a semiconductor device substrate, the method comprising:

depositing a titanium-nitride (TiN) barrier layer on the semiconductor device substrate;

exposing the TiN barrier layer to silane (SiH_4) to form a layer of silicon on the TiN barrier layer;

exposing the layer of silicon to tungsten hexaflouride (WF_6) such that the WF_6 undergoes a reduction reaction with the layer of silicon resulting in the formation of a tungsten layer on the TiN barrier layer;

conducting an alternating exposure of the tungsten layer to SiH_4 and WF_6 to deposit additional tungsten on the tungsten layer and thereby increase the thickness of the tungsten layer and form a tungsten nucleation layer; and

depositing a tungsten core layer on the tungsten nucleation layer using a tungsten chemical vapor deposition reaction wherein WF_6 is reduced with H_2.

19. The method of claim 18, wherein the first exposing step, the second exposing step, the conducting step and the depositing step are all conducted at a pressure in the range of 40 Torr to 300 Torr.

20. The method of claim 18, wherein the first exposing step, the second exposing step, the conducting step and the depositing step are all conducted at a single pressure in the range of 40 Torr to 300.

21. A method for the formation of a refractory metal nucleation layer on a semiconductor device substrate, the method comprising:

depositing a metallic barrier layer on the semiconductor device substrate;

exposing the metallic barrier layer to a silicon containing gas to form a layer of silicon on the metallic barrier layer; and

exposing the layer of silicon to a refractory metal containing gas such that the refractory metal containing gas undergoes a reduction reaction with the layer of silicon resulting in the formation of a refractory metal layer on the metallic barrier layer.

22. A method for the formation of a tungsten nucleation layer on a semiconductor device substrate, the method comprising:

depositing a titanium-nitride (TiN) barrier layer on the semiconductor device substrate;

exposing the TiN barrier layer to silane (SiH_4) at a pressure in the range of 40 Torr to 300 Torr to form a layer of silicon on the TiN barrier layer;

exposing the layer of silicon to tungsten hexaflouride (WF_6) at a pressure in the range of 40 Torr to 300 Torr such that the WF_6 undergoes a reduction reaction with the layer of silicon resulting in the formation of a tungsten layer on the TiN barrier layer;

conducting an alternating exposure of the tungsten layer to SiH_4 and WF_6 at a pressure in the range of 40 Torr to 300 Torr to deposit additional tungsten on the tungsten layer and thereby increase the thickness of the tungsten layer and form a tungsten nucleation layer; and

depositing a tungsten core layer on the tungsten nucleation layer at a pressure in the range of 40 Torr to 300 Torr using a tungsten chemical vapor deposition reaction wherein WF_6 is reduced with H_2.